

**REMARKS**

Claim 16-21 are cancelled herewith. Pending claims now include Claims 1-10 and 12-15. In the event that the pending claims are allowed, Claims 22-26 may be cancelled by the Examiner.

Submitted herewith in connection with this response is the declaration of Alan M. Levine.

The information disclosure statement filed on May 5, 2003 is again submitted for the Examiner's review. According to Applicants' records, there was no information disclosure statement filed on March 3, 2003, as stated in the current office action.

The Office Action again states that the oath or declaration is defective because it does not identify the address of each inventor. Applicants respectfully submit that the declaration and application data sheet previously submitted contain this information and are in accordance with applicable rules. Applicants would like to direct the Examiner's attention to 37 CFR 1.63(a)(2), which states that a declaration must identify each inventor by name and (a)(3) include the country of citizenship of each inventor. Notably, 1.63(a)(3) does not require the city of residence of the inventor. 1.63 further specifies in subpart (c) that "unless such information is provided in an application data sheet in accordance with 1.76", the declaration must include the mailing address of each inventor. Therefore, the declaration need not include the mailing address if this information is provided in the application data sheet. As an application data sheet containing the mailing address of each inventor was submitted with this application, the declaration is not defective. Applicants request withdrawal of this objection.

**Double Patenting**

Claims 1-10 and 12-21 have been provisionally rejected under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-27 of co-pending Application Serial No. 09/925,391. Applicants submit herewith a Terminal Disclaimer to overcome this rejection as it pertains to claims 1-10 and 12-15, and respectfully request that this basis of rejection be withdrawn.

**Rejections Under 35 USC § 103**

The Office Action notes that this application currently names joint inventors. Applicants submit herewith copies of Assignments indicating that both the present application and the continuation-in-part application, 09/925,391, have been assigned to RJLee Group, Inc., and the inventions were commonly owned at the time of invention.

Claims 1-10 and 12-21 were rejected under 35 USC § 103(a) as being unpatentable over Gi (4,463,203) in view of either Roy (4,740,270) or Solbakken et al. (4,250,158) when considered with prior art said to be admitted by applicants. Applicants respectfully traverse this basis of rejection.

Claim 1 recites that heating occurs in three phases and fuel input is adjusted to take advantage of the exothermic nature of the reaction. Applicants respectfully submit that none of the cited references teach or suggest this aspect of the invention, in combination with a clay catalyst under vacuum conditions.

As presently reflected in Claims 1-10 and 12-15, the present invention involves a method of pyrolysis in which the heating of the hydrocarbon material occurs in at least three phases. During each phase, affirmative steps are taken to adjust the fuel input and minimize the energy used, while maintaining the pyrolysis reaction and driving it to completion. As previously pointed out, the specification in Figure 3 shows two heat sources at each end of the reactor chamber (more can be used). These heat sources can be adjusted independently, to provide minimal fuel input when, during the course of the reaction, less is needed. In a batch process, the fuel input can be adjusted over time (by microprocessor, for example), to take advantage of the energy of the reaction.

None of the cited references teach or suggest this aspect of the invention. Applicants disagree with the Examiner's characterization of the Gi reference. The text in Gi asserted by the Examiner to show heating in different phases (column 2, lines 30-51), does not teach the use of different heating phases at all, but merely describes at what temperature the various reactions will occur. The language used indicates that passive observations were made of the reaction process. For example, "the adhered moisture, CO<sub>2</sub>, and CH<sub>4</sub> on the brown coal *was radiated off* in the range of temperature 100° - 200°....."; "Gas, water and tar *was rapidly released* ...."; "after exceeding the temperature of 500°, the production of tar *is hardly present*." There is absolutely no indication that affirmative steps were taken to adjust the fuel input, as in the present invention. Other than the Examiner's bald assertion that one skilled in the art would be motivated to adjust the fuel input because the reaction is exothermic, there is no basis for concluding that this step is taught or suggested anywhere in the prior art. Roy and Solbakken do not teach this aspect of the invention either, and therefore cannot provide the missing teaching. Applicants submit that the present claims are not obvious in view of the Gi reference alone, or in combination with the other references.

The present invention provides unique benefits, in that less energy is used in the pyrolysis method, and yet a high grade of carbon black is produced, with minimal unpyrolyzed material. As established in the declaration of Alan M. Levine, the catalyzed reaction progresses at a higher temperature, even when heat is removed during the reaction (Figure 1). As can be seen in Figure 7, less energy is required to maintain the reaction temperature when a catalyst is used. Figure 7 also demonstrates the benefits of having a zoned reactor, because the reaction proceeds at different rates and temperatures over the course of the pyrolysis process. None of the cited references teach that the reaction progresses in such a manner, and none indicate the usefulness of zoned energy input.

As can also be seen in the data presented in the declaration, use of a clay catalyst results in an improved carbon black product as compared with no catalyst. This can be seen in Figures 2a and 2c, which show scanning electron micrographs of non-catalyzed pyrolyzed carbon black (2a), and pyrolyzed carbon black when bentonite is used as a catalyst (2c). The catalyzed process results in a carbon black having far fewer pock marks and denotes a higher quality product. Figures 3a-3c show the differences in residue on the carbon black particles in bentonite-catalyzed (3c) and non-catalyzed (3a) pyrolysis reactions. Less residue is indicative of a higher quality product. Figures 4a-4c also show this difference in residue, using transmission electron microscope images. Figure 5 shows that less oil and less pitch-like polymeric material is present in the carbon black product from the catalyzed process. Finally, Figure 6 shows a sieve analysis of the carbon black product from both catalyzed and non-catalyzed reactions. More of the carbon black product from the catalyzed reaction was able to fit through the sieve, indicating less polymer in the carbon black.

These results could not have been predicted by one skilled in the art, based on the teachings of the cited references, or any based on any references known to Applicant.

The Examiner picks and chooses among references, using hindsight, to arrive at the present invention. As previously noted, Gi uses much higher temperatures than Applicants': at column 1, line 14, a pyrolysis temperature range of 600-700 °C is disclosed, which converts to 1112 -1292°F. The example shows use of even higher temperatures, 700-800°C (col. 4, line 55). There is no suggestion in Gi that temperatures can be lowered, and yet achieve complete pyrolysis.

Nevertheless, the Examiner has combined Gi with Solbakken or Roy, said to disclose similar processes under low pressure, to arrive at the present invention. Roy is cited for teaching a low pressure pyrolysis process, but the "sub-atmospheric pressure" used in Roy

is insignificant (< 35mm Hg, which converts to < 1.38 in. Hg), in comparison with the low pressure used in the present invention (2-16 in. Hg). There is no suggestion in Roy that a lower pressure in combination with the temperatures disclosed will result in an improved carbonaceous product. Moreover, at column 1, lines 65- 68, and as pointed out by the Examiner in the present office action at page 3, 4<sup>th</sup> paragraph, Roy discloses that under sub-atmospheric pressure, *the yield of the highly desire liquid hydrocarbons is significantly increased, while the yields of the less desired gaseous hydrocarbons and solid carbonaceous material are lowered* (emphasis added). One skilled in the art would obtain no guidance whatsoever on how to improve the solid products of pyrolysis, as these are disclosed as undesirable. In fact, Roy can be said to teach away from the present invention. According to the MPEP 2145, it is improper to combine references where the reference or references teach away from the combination. Therefore, the Roy reference cannot be combined with Gi to arrive at the present invention.

Solbakken is also cited for teaching a low pressure pyrolysis process. However, Solbakken does not teach the use of heating in more than one phase or use of a catalyst, and uses much higher temperatures than those used in the present invention: 750°-1800°F, as compared with 450°-850° in the present invention. Solbakken does not disclose that use of a low pressure system in combination with the temperatures used in the present invention would provide complete pyrolysis and an improved carbon black product. One skilled in the art would find no guidance in Solbakken on how to use temperatures lower than those disclosed, and yet achieve complete pyrolysis. Generally, one assumes that lowering temperatures in pyrolysis will result in incomplete pyrolysis of the hydrocarbon material, and in the absence of specific guidance one skilled in the art would not expect that lower temperatures would suffice.

The process of Solbakken shows other differences from the method of the present invention. Solbakken heats the waste material to loosen fibers and then separates the pieces before complete pyrolyzation. In any event, there is no suggestion in Solbakken that a catalyst will be effective at the temperatures and pressures disclosed as suitable for the method of that invention.

A teaching or suggestion of the claimed combination and a reasonable expectation of success must be found in the prior art references to support a rejection under 35 U.S.C. § 103. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The mere fact that references can be combined does not render the combination obvious unless the prior art suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430

(Fed. Cir. 1990). There is no such suggestion in any of the art discussed above, as none of the cited references teach or suggest a method of vacuum pyrolysis, using a catalyst, in which the heating is carried out in at least three phases, to take advantage of the exothermic nature of the reaction. These cases were enclosed with a previous response.

**SUMMARY**

As all outstanding issues have been addressed, Applicants submit that Claims 1-10 and 12-15 are in condition for allowance; such action is respectfully requested at an early date.

Respectfully submitted,



Debra Z. Anderson  
Registration No. 44,506  
Attorney for Applicants

412.566.1910

## ASSIGNMENT

WHEREAS, we, **Ronald Nichols**, residing at 253 Normandy Road, Evergreen, Colorado 80439, **Alan M. Levine**, residing at 339 Coleman Drive, Monroeville, Pennsylvania 15146 and **Jules E. Langlois**, residing at 3732 Milligantown Road, New Kensington, Pennsylvania 15068, have invented certain new and useful improvements in the invention entitled **LOW ENERGY METHOD OF PYROLYSIS OF HYDROCARBON MATERIALS SUCH AS RUBBER** for which we filed Application Serial No. **09/925,401** having a filing date of **August 9, 2001**;

AND WHEREAS **RJ Lee Group, Inc.**, a Pennsylvania corporation, having its principal place of business at 350 Hochberg Road, Monroeville, Pennsylvania 15146, hereinafter called the "Assignee", is desirous of acquiring the entire right, title, and interest in and to said application and the inventions and improvements therein disclosed;

NOW, THEREFORE, in consideration of One (\$1.00) Dollar and other good and valuable consideration paid to us by said Assignee, receipt whereof we hereby acknowledge, we do hereby assign, sell, transfer, and set over unto said Assignee the entire right, title, and interest in and to said application and the inventions and improvements therein disclosed for the United States of America and all foreign countries and any Letters Patent which may issue therefor in the United States of America and all foreign countries and all divisions, reissues, continuations, renewals, and/or extensions thereof including all priority rights under the International Convention associated therewith for each country and the Union, said Assignee to have and to hold the interests herein assigned to the full ends of the terms of said Letters Patent and any and all divisions, reissues, continuations, renewals, and/or extensions thereof, respectively, as fully and entirely as the same could have been held and enjoyed by us had this assignment not been made.

The Commissioner of Patents and Trademarks is requested to issue such Letters Patent in accordance herewith. We covenant that we are the lawful owners of the said application, inventions, and improvements, that the same are unencumbered, that no license has been granted to make, use, or vend the said inventions or improvements or any of them, and that we have the full right to make this assignment.

And for the consideration aforesaid, we agree that we will communicate to said Assignee or the representatives thereof any facts known to us respecting said inventions and improvements, and will, upon request, but without expense to us, testify in any legal proceedings, sign all lawful papers, execute all divisional, reissue, continuation, renewal, and/or extension applications, make all rightful oaths, and generally do all other and further lawful acts, deemed necessary or expedient by said Assignee or by counsel for said Assignee, to assist or enable said Assignee to obtain and enforce full benefits from the rights and interests herein assigned. This assignment shall be binding upon our heirs, executors, administrators, and/or assigns, and shall inure to the benefit of the heirs, executors, administrators, successors, and/or assigns, as the case may be, of said Assignee.

EXECUTED 11/11/03

  
RONALD NICHOLS (SEAL)

STATE OF COLORADO

COUNTY OF Jefferson

)  
) SS: 557-68-8184  
)

Before me this 11<sup>th</sup> day of November, 2003, personally appeared **RONALD NICHOLS**, to me personally known to be the person who is described in and who executed the above instrument, and he acknowledged to me that he executed the same of his own free will for the purposes therein set forth.

  
Notary Public

(Affix Seal Here)

EXECUTED \_\_\_\_\_

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(SEAL)

**ALAN M. LEVINE**

STATE OF PENNSYLVANIA )  
                          )  
COUNTY OF ALLEGHENY ) SS:  
                          )

Before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_, personally appeared  
**ALAN M. LEVINE**, to me personally known to be the person who is described in and who  
executed the above instrument, and he acknowledged to me that he executed the same of his own  
free will for the purposes therein set forth.

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Notary Public

*(Affix Seal Here)*

EXECUTED \_\_\_\_\_

(SEAL)

**JULES E. LANGLOIS**

STATE OF PENNSYLVANIA )  
COUNTY OF WESTMORELAND ) SS:  
                          )

Before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_, personally appeared  
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Notary Public

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EXECUTED \_\_\_\_\_

(SEAL)

**RONALD NICHOLS**

STATE OF COLORADO )  
 )  
COUNTY OF \_\_\_\_\_ )  
 )  
 ) SS:

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\_\_\_\_\_  
Notary Public

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EXECUTED \_\_\_\_\_

Alan M. Levine (SEAL)  
ALAN M. LEVINE

STATE OF PENNSYLVANIA

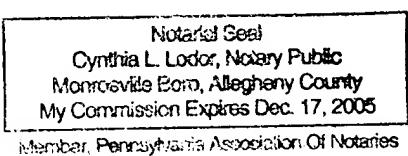
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COUNTY OF ALLEGHENY

) SS:

)

Before me this 10<sup>th</sup> day of November, 2003, personally appeared **ALAN M. LEVINE**, to me personally known to be the person who is described in and who executed the above instrument, and he acknowledged to me that he executed the same of his own free will for the purposes therein set forth.



Cynthia L. Lodor

Notary Public

(Affix Seal Here)

EXECUTED \_\_\_\_\_

\_\_\_\_\_  
**JULES E. LANGLOIS** *(SEAL)*

STATE OF PENNSYLVANIA )  
COUNTY OF WESTMORELAND )  
                          ) SS:  
                          )

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EXECUTED \_\_\_\_\_

(SEAL)

**RONALD NICHOLS**

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\_\_\_\_\_  
Notary Public

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EXECUTED \_\_\_\_\_

*(SEAL)*

**ALAN M. LEVINE**

STATE OF PENNSYLVANIA

)

) SS:

COUNTY OF ALLEGHENY

)

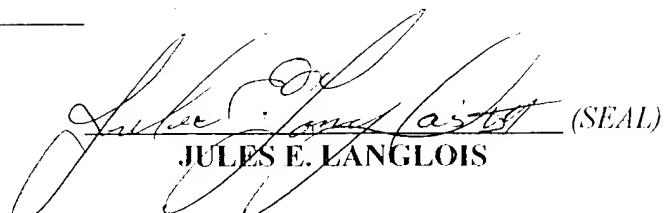
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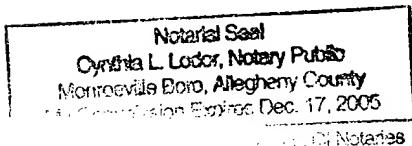
Notary Public

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EXECUTED \_\_\_\_\_

  
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STATE OF PENNSYLVANIA  
COUNTY OF WESTMORELAND  
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